corroded debris, though likewise finally deepening, widening, and smoothing the basins in the solid rock.

The Hills and Hill-groups of Britain have all emerged during the gradual denudation of the country, and owe their prominence to the greater durability of their materials as compared with those of the surrounding lower grounds. They thus represent various stages in the general lowering of the surface. In many cases they consist of local masses of hard rock. Such is the structure of the prominent knobs of Pembrokeshire and of Central Scotland, where masses of eruptive rock, formerly deeply buried under superincumbent formations, have been laid bare by denudation. In connection with such eruptive bosses attention should be given to the "dykes" so plentiful in the north of England and Ireland, and over most of Scotland. In numerous instances, the dykes run along the crests of hills and also cross wide and deep valleys. Had the existing topography existed at the time of their protrusion, the molten basalt would have flowed down the hill-slopes and filled up the valleys. As this never occurs, and as there is good evidence that the dykes are not of higher antiquity than the older Tertiary periods, we may conclude that the present configuration of the country has, on the whole, been developed since older Tertiary time—a deduction in harmony with that already announced from other independent evidence.

Escarpments are the steep edges of hills in retreat. The British Islands abound in admirable examples of all ages from early Palæozoic rocks down to Tertiary deposits, and of every stage, from the almost unbroken line of cliff to scattered groups of islet-like fragments. The retreat of our escarpments can be well studied along the edge of the Jurassic belt from Dorsetshire to the headlands of Yorkshire, likewise in the course of the edge of the Chalk across the island. Not less suggestive are some of the escarpments of more ancient rocks, such as those of the older Palæozoic limestones, the Old Red Sandstone of Wales, the Carboniferous Limestone and Millstone Grit of Yorkshire, and the Coal Measures of the Irish plain. Our volcanic escarpments are likewise full of interest—those of the Lower Old Red Sandstone along both sides of the Tay, of the Carboniferous system in Stirlingshire, Ayrshire, Bute, and Roxburghshire, and of the Tertiary series in Antrim and the Inner Hebrides.

SUN-GLOWS AND VOLCANIC ERUPTIONS IN ICELAND

IN reply to the inquiry despatched to me by NATURE with last mail, whether any remarkable sun-glow had been observed recently in Iceland, and which, I learn, has been observed in nearly all parts of the world, and whether any volcanic eruption had lately taken place in the island to which the same might be attributable, I beg to relate, as regards the first of these points, that on November 23, between 5 and 6 p.m., I noticed for the first time an unusual and striking purple intensity of the sky, a phenomenon which was also observed on the subsequent mornings and nights. I did not attach much importance to this phenomenon at the time, through the circumstance that I was told that sunrises and sunsets were generally attended by very intense auroræ here, and since then I have had so few opportunities of seeing the sky free from clouds that I have not observed any similar phenomenon. I learn, however, on inquiry here, that the same glow was observed once or twice before Christmas by several persons. On one occasion, January 30, the sky was perfectly clear several hours after sunset, but there was no unusual glow.

With regard to the second point, as to recent volcanic eruptions in the island, I have not much new information to transmit (NATURE, vol. xxix. p. 343). The only thing we know as to this is that a man has written a letter to an Iceland paper stating that on October 8 and 9 last year he was at a farm about three geographical miles east-north-east inland from the well-known fishing village Seydisfjord, on the east coast, when he saw, on the first-mentioned day, in the direction of the unexplored gigantic volcanic mountain, the Vatnajökull, about 130 geographical miles in extent, in the south-eastern corner of the island, two columns of fire, and on the following morning, in the same direction, two columns of smoke. He adds that a similar phenomenon was observed on the farm two days previously. It is also reported to us here that ashes have fallen in Seydisfjord.

It is most probable that these eruptions have occurred in the same place where similar phenomena have been observed several times in recent years, viz. in the neighbourhood of the Kverk Mountains on the north side of the Vatnajökull, and that there are, in all probability, several volcanoes in activity in this district, which is utterly unapproachable to explorers.

There is, however, no reason to assume that eruptions of any magnitude have recently taken place in any other part of the island, as such an occurrence would soon have been reported by some means or another to us here.

If, therefore, the remarkable sun-glows of which I read are attributed to terrific volcanic eruptions, the latter must be sought in other localities than Iceland.

SOPHUS TROMHOLT

Reykjavik, Iceland, February 1 (by mail February 8)

COMPOSITE PORTRAITURE ADAPTED TO THE REDUCTION OF METEOROLOGICAL AND OTHER SIMILAR OBSERVATIONS

IT has often been remarked that one of the main, if not the chief, of the difficulties the meteorologist has to contend with, is the enormous amount of preliminary labour which has to be expended in the not very pleasing task of forming the observations he may wish to discuss into tables, casting the columns of figures so obtained, and then computing the means. Should, as in many cases nowadays, his original material be in the shape of curves, *e.g.* barograms, thermograms, or anemograms, he has first to reduce these to figures by tabulation, before he can attempt any step towards their reduction.

The deterrent nature of these preliminary operations not unfrequently forms a complete bar to the entering upon most interesting investigations with a view to the advancement of the science, in the case of persons unable to devote sufficient time to such labour, which may almost be termed drudgery. To cite examples, a glance at the recently published papers in the *Proceedings of the Royal Society*, by Prof. Balfour Stewart (vol. xxv. p. 577) and by Mr. C. Chambers (vol. xxxiv. p. 231), in which they endeavour to trace a possible intimate connection between solar and terrestrial phenomena, will show the immense amount of calculation they had to perform in order to arrive at their results—how, for instance, preliminary means had to be taken of three days' observations and the result assumed to be a corrected value for the middle day of the three, then, after the whole series had been so treated, a second or even a third set of averages computed. The author has also a lively recollection of the excessively tedious calculations required to eliminate in a somewhat similar manner the effect of disturbances in the discussion of the Kew magnetic observations for the late Sir E. Sabine. With the view of arriving at results by a shorter cut, the author has been led to consider the possibility of employing a method suggested by an examination of the highly ingenious system of composite portraiture invented by Mr. Francis Galton, F.R.S., and utilised in his anthropological studies.

Mr. Galton's method of experiment is based upon the fact that certain groups of people possess certain physiognomical features in common. This agreement of feature is usually characterised by the term "family likeness." In order, therefore, to select this particular element from the others, and to obtain a picture in which it is most strongly defined; or, in other words, to form a characteristic portrait of the group of individuals, Mr. Galton employs a series of photographs. These, representing a large number of men or women, are first reduced to the same scale, and then projected successively upon a sensitised photographic plate, having been previously so arranged that the eyes or other salient feature shall always fall on the same portion of the plate.

In this manner a negative is eventually obtained which gives a print depicting a countenance which, although resembling but partially any one of the component portraits, gives a fair typical picture of the group of individuals. Among other results Mr. Galton has detected the likeness existing in various classes of criminals, and also in patients suffering from the same disease, as well as the more marked features transmitted through the different members of a family.

Since in meteorological investigations the desire is to select and to identify the one particular variable running through a group of phenomena, it has appeared to the author, arguing by analogy, feasible to perform this operation by a method somewhat resembling that just described. Supposing, for example,

[1] By G. M. Whipple, B.Sc., F.R.Met.Soc., F.R.A.S., Superintendent of the Kew Observatory, Richmond (from the *Quarterly Journal of the Meteorological Society*, vol. ix. No. 48).

it is desired to determine the true curve of diurnal variation of the wind velocity at any given station. In the case of proceeding by the ordinary routine of hourly sums and means, it will be found that the occurrence of a high wind or gale on a single day will vitiate the results for a considerable period of time.

If, on the other hand, instead of doing this, a drawing or photograph be made on one sheet of the daily curves for a few weeks, it will be found that the traces for the days free from storms will lie so fairly close together or upon one another, that little difficulty will be found in selecting or drawing through them a curve representing the general run of the group. Several sets of curves having been so treated, the typical curves must be in turn themselves superimposed, and through them another curve drawn, which will be still less affected by abnormal movements; so eventually the true curve of diurnal variation would be arrived at.

In the case of subjecting photographic traces, *e.g.* barograms, thermograms, electrograms, magnetograms, &c., to this treatment, it would be advisable to employ secondary impressions or prints from the original curves, in order that the composite produced might consist of dark lines on a white background; not the reverse, which would be comparatively useless for the purpose.

For the reduction of anemograms, rain, and sunshine curves by this method, it will be necessary to make drawings or tracings first from the curves, giving the hourly values separated, as is done in the diagrams published in the *Quarterly Weather Reports* of the Meteorological Office and in the Kew *Times* curves.

Another application of the method of composite drawing will serve to facilitate the acquisition of a knowledge of the general distribution of weather systems over large tracts of the earth's surface. To do this, a series of weather charts should be taken, and selecting certain prominent features, such as the centres of cyclonic and anticyclonic disturbances, day by day their positions should be marked off upon one chart. This being done in a sufficient number of cases and combined, a repetition of the process would enable a determination to be made of the average distribution of these systems for a given season.

The author illustrated his proposed applications of the method of composite portraiture by three examples, which were exhibited to the meeting of the Society. The data treated in every case were chosen at random, and therefore may be considered as indicating the applicability of the process to meteorological work in general.

In the first example the mean diurnal variation in the wind velocity at the Kew Observatory, Richmond, was determined for three months—August to October, 1879. Taking the hourly values of the rate at which the wind was blowing from the Meteorological Office publications, they were plotted down on a conveniently open scale, a fortnight's superimposed curves being on a sheet. Through the fourteen curves so drawn in pencil a mean curve was traced in red. This roughly represented the average daily variation during the fortnight.

The pair of fourteen-day curves being superimposed on a third sheet, a third trace drawn between them was assumed to be the mean trace for the month, and finally combining the three so derived months' traces, it became easy to draw the final curve showing the mean diurnal variation of wind velocity during the quarter in question.[1]

The second experiment was an attempt to obtain a monthly mean of the barometer directly by the graphic method. Taking advantage of a self-registering aneroid being on trial, its traces were utilised for the month January 8 to February 7, 1883. These were copied off on a sheet of tracing paper, ruled so as to comprise one day's curve only. The tracing paper was then folded vertically, so as to compress the curves, and the mean positions of the traces were drawn on the folds. After four foldings a point was readily fixed upon as the position of the mean of the month, and the value of this point referred to the scale of the instrument. The resulting value for the mean barometric pressure of the month very satisfactorily agreed with the value determined by calculation from the barometer readings taken daily at the Observatory.

The third series of illustrations represented the general positions of the centres and the contours of the areas of maximum and minimum barometric pressure over the Atlantic during January, February, and March, 1881. A number of blank charts were worked off by the chromograph, on tracing paper, to the scale of the international synchronous charts of the U.S. War Department Signal Service. Tracings were made on one sheet in blue pencil of the cyclonic centre for each day of the month, and then on another a similar set of tracings in red of the anticyclonic centres. Having from these drawn the prevailing positions and areas of the systems for the month, it was easy to draw another chart with the general distribution for the quarter. The diagrams were seen, on comparison, to differ materially from those drawn for the monthly means of the observations. In suggesting the composite method of treatment of meteorological data, the author is fully aware that a somewhat similar process has been already applied in the determination of the radiant points of shooting stars, and would also desire to state that the process is not by him considered as equalling or even approximating in accuracy that of employing the harmonic analyser in computing the periodical variations of the elements. As, however, that instrument is not at the command of many investigators, he is of opinion that the labour of reduction may in many cases be saved by making use of the graphic or composite, instead of the purely numerical, method.

[1] It must be remarked that a due proportion should be preserved between the scales of the ordinates and abscissæ, for unless this is done the combined traces may appear merely as a mass of confused lines. Such was the case in some experiments made by the author, when he attempted to derive mean curves directly from the zinc templates engraved at the Meteorological Office for the Quarterly Weather Reports, kindly placed at his disposal by Mr. Scott.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—Dr. Hans Gadow, Strickland Curator, has been approved as a Teacher of Comparative Anatomy; Mr. L. Humphry, M.B., as a Teacher of Pathology; and Mr. F. H. Neville as a Teacher of Practical Chemistry.

Messrs. J. W. Hicks, R. D. Roberts, and A. S. Lea are appointed Examiners in Natural Science in the Special Examinations for the ordinary B.A. degree.

The Examiners' Report on the Special Examinations in Natural Science states that there was no improvement in the book work, but the practical work was more intelligently done. The few candidates in Geology did well. Botany was ill done. In Zoology the candidates did well.

Mr. J. A. Lyon (Clare College) has been appointed to the new office of Superintendent of the Mechanical Workshops.

SCIENTIFIC SERIALS

Bulletin de l'Académie Royale de Belgique, November 3, 1883. On the anatomy and histology of a new species of derostoma (*D. benedenii*), by M. Francotte.—Report on the work still required to complete the geodesic survey of Belgium, by Capt. Delporte.—Observations on the periodic shooting stars made at Louvain in 1882-83, by M. Terby.—Influence of magnetic disturbances on the scintillation of the stars, by M. Charles Montigny. The paper is accompanied by various comparative tables showing the intensity of scintillation before, during, and after the magnetic disturbances in dry and wet weather.—Summary report on the researches undertaken at the Ostend biological station during the summer of 1883, by Edouard van Beneden. Amongst the remarkable objects fished up near this station were a torpedo of unusual size (*Torpedo marmorata*), a fine specimen of *Labrus maculatus*, an *Amphioxus lanceolatus*, and an unknown species of Scopelidæ, referred by Günther of the British Museum to the Odontostomus, or some allied genus.—On the observation of very rapid movements, especially when occurring periodically, by M. J. Plateau.—Analytical study of the volcanic ashes which fell at Batavia during the eruption of Krakatoa on August 27, 1883, by M. Renard. The author concludes that these ashes are formed by the pulverisation of a fluid igneous mass, whose particles, projected by the expansion of the gases, are subjected to rapid cooling during their passage through the atmosphere. Nothing was detected to indicate the direct action of vapour of water in volcanic disturbances.—On the perfect elasticity of solid bodies chemically defined. New analogy between solids, fluids, and gases, by W. Spring. Here are embodied some of the results of the researches conducted by the author for several years on the action of pressure on solids reduced to a powder. The main object of these researches was to ascertain by experiment whether it be possible by means of pressure permanently to diminish the volume occupied by a given weight of a solid body chemically defined. As a general result, a slight increase of density was obtained under a pressure of 20,000 atmospheres. But, this once realised, most bodies resisted all further perma-